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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/534,475	05/10/2005	Raoul Florent	FR020121US	5009
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GUPTA, VANI				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/534,475

Applicant(s)

FLORENT ET AL.

Examiner

VANI GUPTA

Art Unit

3768

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-4, 6-10 and 14-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-4, 6-10 and 14-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

1. ***Claim 16 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.***

Applicant claims a "computer readable storage medium," which is non-statutory because it does not clarify that the storage medium is of non-transitory (i.e., non-signal) type of medium. Therefore, and according to the latest memorandum issued by the Office, by not emphasizing non-transitory, this claim is being broadly interpreted to include non-transitory and transitory (signal) types of computer readable mediums.

Applicant is requested to amend the claim to include non-transitory computer readable medium to overcome this rejection.

Claim Objections

2. ***Claim 10*** is objected to because of the following informalities: line 3 includes "ore." Examiner believes Applicant meant to state "or." Appropriate correction is required.
3. ***Claim 14*** is objected to because of the following informalities: line 3 includes "disgnosite." Examiner believes Applicant meant to state "diagnostic." Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2 – 4, 7 – 9, and 14 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Slager (US 5,771,895) in view of Close et al. (US 6,532,380 B1).

Regarding Claim 19, Slager discloses a medical viewing system for displaying a sequence of medical images that depict moving and/or positioning an imageable tip of a guide-wire in a blood vessel, the system including:

- a. one or more processors programmable (*col. 1, line 64*) to perform a series of steps:
 - i. acquire a sequence of noisy images (fluoroscopic/x-ray images, as defined by present disclosure) of a region of interest of a patient depicting the imageable tip of the guide-wire, the blood vessel in which the guide-wire is disposed, and background outside the blood vessel (*col. 7, ll. 19 – 21*); and
 - ii. detecting the guide-wire tip: Close depicts the entire the guide-wire, and therefore, the imageable tip of the guide-wire (*col. 11, ll. 7 – 11; col. 12, ll. 62 – 63*).
 - iii. defining a centerline for a tubular device of the entire device, and the tip of the device (*Abstract; col. 1, line 66 – col. 2, line 1; col. 12, ll. 62 – 63*).

- iv. calculate a field of motion vectors defining motion of the tip in each most recently acquired noisy image relative to a previously acquired reference noisy image, by tracking the radiopaque markers situated along the centerline of the device from one image to the next images (*col. 4, col. 4, ll. 10 – 11, 17 – 19, 34 – 47; col. 10, ll. 46 – 48; col. 11, ll. 11 – 15*); and
- v. register the entire guidewire, and therefore the guide-wire tip, with respect to the previously acquired reference noisy image based on the field of motion vectors (*fig. 4; col. 11, ll. 43 – 67*).

However, Slager does not disclose specifically the following step:

- vi. combine the most recently acquired noisy image of the sequence with a plurality of previously acquired noisy images of the sequence which have been registered to the reference noisy image such that the tip of the guide-wire and walls of the blood vessel adjacent the guide-wire tip are enhanced while the background is blurred, and the center lines of the tip and the most recently and previously acquired noisy images define a line.

Nonetheless, *Close et al.* (hereinafter *Close*) suggests blurring images by superimposing images so that background structures are “subtracted” from the images of the tracked device structure to visualize the device (*col. 5, line 37 – col. 7, line 16*). *Close* also discloses a

- b. display capable of displaying each most recently acquired noisy image combined with the plurality of previously acquired noisy images in real time to provide the

sequence of medical images depicting movement of the guide-wire through the blood vessel with the vessel walls enhanced (*col. 8, ll. 33 – 41*).

Accordingly, it would be prima facie obvious to combine Slager with Close so that one may “reduce tracking errors [that] may be caused by background structures” (*Close: col. 7, ll. 5 – 7*).

Regarding Claim 2, Slager presents the system as claimed in claim 19, wherein the calculating the motion vectors with the one or more processors: spatially extending the centerline in the most recently acquired noisy image with the centerline of a previously acquired image; matching the centerline in the most recently acquired noisy image; estimating the motion vectors based on the matching of the centerlines (*col. 6, ll. 30 – 35; col. 7, line 19 - col. 9, line 15*).

Regarding Claim 3, Slager in view of Close suggests the system of Claim 2, wherein combining the most recently acquired noisy image with the plurality of previously acquired registered noisy images includes, with the one or more processors capable of applying the motion vectors to the full most recently acquired noisy image such that the guide-wire tip and the vessel walls of the most recently acquired noisy image are registered with the guide-wire tip and the vessel walls of the plurality of previously acquired registered noisy images and the background of the most recently acquired noisy image and the background in the plurality of previously acquired noisy images are misaligned such that in combining the registered most recently acquired noisy image with the plurality of previously acquired registered noisy images, the vessel walls are enhanced and the background blurred (*please see rejection of Claim 19; and*

col. 7, ll. 19 – 21). Slager discusses “aligning” images during this process, which suggests that the images were originally “misaligned.”

Regarding Claim 4, Slager in view of Close suggests the system claim 19, further comprising: a user operated control by which a user is capable of activat[ing] the image acquisition device to acquire noisy images, starts the one or more processors to start registering and combining each most recently acquired image with the previously acquired registered noisy images, and stops the one or more processors to stop the series of images, since both suggests that the disclosed steps are performed by computer means that, as is known in the art, may comprise user interface that allows user input to perform these features (*Slager; col. 1, line 64; and Close: col. 8, ll. 39 – 41*).

Furthermore, it would be obvious to one of ordinary skill in the art to modify Slager in view of Close to include a user interface for manual means such as the one described in this claim, since it has been held broadly that providing an automatic or mechanical means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art, and involves only routine skill in the art. See *In re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958).

Regarding claims 7 and 8, Slager in view Close suggests the system of claim 19, wherein combining the most recently acquired noisy image with the previously acquired image includes superimposing the registered most recently acquired image on at least one previously acquired registered noisy image (*see rejection of Claim 1(a)iv; and col. 6, ll. 55 – 67*); and wherein the at least one previously acquired registered noisy image includes a plurality

(“multiple frames”) of the previously acquired registered noisy images which have been combined (*col. 8, ll. 1 – 15*).

Regarding Claim 9, Slager suggests the system of claim 19, wherein if contrast agent is periodically injected into the vessel such that in the most recently acquired noisy image after injection of the contrast agent, the tip is obscured by the contrast agent and wherein the combining step includes with the one or more processors, combining the most recently acquired noisy image with at least one previously acquired noisy image in which the centerline of the tip is depicted (*col. 5, ll. 38 – 43*). Applicant should note that the feature of actually “periodically injecting contrast agent into the vessel” includes claim language that would read on feature(s) that would be included in a method claim and therefore does not further limit the structure of the system of Claim 19, especially since a component for “periodically injecting contrast into a vessel” is not claimed.

Regarding Claim 14, Slager suggests a medical examination imaging apparatus a comprising: a diagnostic imaging device that is capable of acquiring the sequence of noisy medical images in real time, since the acquired x-ray images are NOT previously acquired images; and a viewing system according to claim 19 which processes and displays series of images (*please see rejection of Claim 19*).

Regarding Claim 15, Slager in view of Close suggests computer executable image processing method for displaying in a medical viewing system a sequence of medical images that represents moving and/or positioning a guide-wire in a blood vessel, the method comprising:

- a. acquiring a sequence of noisy images of the blood vessel and the guide-wire as the guide-wire moves in the blood vessel (*see rejection of Claim 19*);

- b. processing the sequence of noisy images in real time, the processing comprising:
 - i. detecting automatically the guide-wire tip: see rejection of Claim 19. As for automatically performing this step, Applicant is reminded that it has been held broadly that providing an automatic or mechanical means to replace a manual activity which accomplished the same result is not sufficient to distinguish over the prior art, and involves only routine skill in the art. See *In re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958);
 - ii. identifying a skeleton of the guide-wire tip comprising a series of pixels along a centerline of the tip (*please refer to Claim 19 rejection; and col. 8, ll. 21 – 38*) – it would be obvious to one of ordinary skill in the art that the radiopaque markers along the centerline of the device, as taught by Slager, would show up as a thin dark line in images;
 - iii. determining a field of motion vectors based on said skeleton (*refer to rejection of Claim 19*);
 - iv. registering automatically the guide-wire tip with respect to a prior reference image of the sequence based on the field of motion vectors (*see rejection of Claim 19*). Again, Applicant is reminded that an “automated” process over a relatively “manual” does not give the present invention patentable weight over prior art (please see above).
 - v. integrating temporally by averaging pixel intensity over a plurality of the noisy images of the sequence that are registered to the reference image, thereby

- enhancing the blood vessel and blurring background (*please see rejection of Claim 19*); and
- c. displaying the processed sequence (*please see rejection Of Claim 19*).

Regarding Claim 16, Slager in view of Close suggests a computer readable storage medium comprising instructions for carrying out a computer executable image processing method for displaying in a medical viewing system a sequence of medical images that represents moving and/or positioning a guide-wire in a blood vessel. A computer readable storage medium may comprise the local hard drive on the computer of Close (*col. 8, ll. 38 – 41*).

The method comprising:

- a. acquiring an original live sequence of noisy images called a sequence (*please rejections of claims 14, 15, and 19*);
- b. starting an automatic device to deliver diluted contrast agent into blood vessel (*please rejections of claims 9, 14, 15, and 19; col. 7, ll. 29 – 31*). Again, Applicant is reminded that an “automated” process over a relatively “manual” does not give the present invention patentable weight over prior art (*please see above*);
- c. processing the live sequence of noisy images in real time, the processing comprising for each most recently acquired noisy image of the sequence:
- i. detecting automatically the guide-wire tip generating a skeleton of the guide-wire tip comprising a series of pixels along a centerline of the tip (*please rejections of claims 15 and 19*);

- ii. generating field of motion vectors based on said skeleton (*please rejections of claims 15 and 19*);
- iii. registering automatically the guide-wire tip with respect to a prior reference image from the live sequence based on the field of motion vectors (*please rejections of claims 15 and 19*);
- iv. enhancing the guide-wire and the-vessel walls while blurring and integrating temporally by averaging pixel intensity over the most recently acquired image registered to the reference image and a plurality of preceding noisy images of the live sequence registered to the reference image, thereby enhancing blood vessel adjacent the tip, blurring the background, and enhancing a line corresponding to the tip centerline in the integrated most recently acquired and preceding noisy images (*please rejections of claims 15 and 19*); and
- d. displaying the processed live sequence (*please rejections of claims 14, 15, and 19*).

Regarding Claim 17, Slager in view of Close suggests a method for positioning a guide-wire in a blood vessel, which guide-wire has a guide-wire tip that is contrasted with respect to the guide-wire, the method comprising:

- a. operating a medical viewing system to acquire an original (not previously acquired) sequence of noisy images called a live sequence (*please rejections of claims 14, 15, 16, and 19*);
- b. processing the live sequence of images in real time, the processing comprising:

- i. detecting the guide-wire tip, yielding a skeleton of the guide-wire tip comprising a series of pixels along a centerline of the guide-wire tip, and field of motion vectors based on the skeleton (*please rejections of claims 14, 15, 16, and 19*);
- ii. delivering diluted contrast agent into the blood vessel (*please rejections of claims 14 and 16*);
- iii. registering the guide-wire tip with respect to a reference based on the field of motion vectors (*please rejections of claims 14, 15, 16, and 19*);
- iv. integrating temporally by averaging pixel intensity over several images to enhance the images of the guide-wire and the vessel walls while blurring background in registered images (*please rejections of claims 15, 16, and 19*); and
- c. displaying a live sequence of processed images (*please rejections of claims 14, 15, 16, and 19*).

Regarding Claim 18, Slager in view of Close suggests the computer readable storage medium of claim 15, wherein the integrating step including integrating the centerline of the tip to generate a ridge or line depicting the guide wire. For purposes of examination, Examiner interprets “ridge” or “line” to read along lines of the skeleton as claimed in Claim 15. (*Please see rejection of Claim 15 for further details.*)

2. Claim 6 is rejected under 35 USC 103(a) as being obvious over Slager in view of Close, as applied to Claim 19 above, in further view of in view of Mo (US 6,413,217).

Regarding Claim 6, Sagel in view of Close discloses a medical viewing system of Claim 19, as discussed above.

However, Sagel in view of Close does not disclose wherein the one or more processors are further programmed to: zoom the displayed Region of Interest (ROI).

Nonetheless, Mo teaches zooming (or “enlarging”) a displayed ROI (*fig. 1; col. 2, ll. 19 – 39; and col. 2, line 67 – col. 3, line 11*).

Accordingly, it would be prima facie obvious to modify Slager in view of Close with Mo so that one could simultaneously view an enlarged image of ROI with an image of the area surrounding the ROI.

3. Claim 10 is rejected under 35 USC 103(a) as being obvious over Slager in view of Close, as applied to Claim 19 above, further in view of Webler (US US 2007/0055142 A1).

Regarding Claim 10, Slager in view of Close suggest the medical viewing system of Claim 19, as discussed above.

However, Slager in view of Close does not suggest specifically that calculating the motion vectors with the one or more processors is further based on breathing characteristic and heart pulse characteristic).

Nonetheless, Webler teaches “contemporaneously” determining a three-dimensional position of a medical device using physiological parameters (*fig. 19; pg. [0023]*).

Accordingly, it would be prima facie obvious to modify Slager in view of Close with Webler to include association of physiological parameters with images so that one could obtain more accurate and precise tracking of position and orientation of a guide wire in a blood vessel (*paragraph [0061]*).

Response to Arguments

4. *Applicant's arguments with respect to claims 2 – 4, 6 – 10, and 14 – 19 have been considered but are moot in view of the new ground(s) of rejection.*

Applicant should note that while Applicant's arguments have been fully considered, new grounds of rejections and application of new art are not being applied *because* of the validity (or invalidity) of Applicant's arguments with respect to cited prior art ***Zarkh et al. (US 2008/0247621 A1)***, but rather because during examination Examiner noticed that the effective priority date (i.e., filing date: 4/10/2008) of Zarkh is after the effective filing date of the present application (11/13/2002).

Examiner places on record that Applicant has not made a note of this date disqualification himself/herself.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VANI GUPTA whose telephone number is (571)270-5042. The examiner can normally be reached on Monday - Thursday (8:30 am - 6:00 pm; EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/V. G./
Examiner, Art Unit 3768

/Long V Le/
Supervisory Patent Examiner, Art Unit 3768